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Docket No.: SON-1908/DIV
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Takeshi Nogami et al.

Application No.: 10/759,194

Confirmation No.: 7751

Filed: January 20, 2004

Art Unit: 2823

For: METHOD FOR PRODUCING SEMICONDUCTOR DEVICE, POLISHING APPARATUS, AND POLISHING METHOD

Examiner: F. L. Toledo

RESPONSE TO NOTICE OF NON-COMPLIANT APPEAL BRIEF (37 C.F.R. 41.37)

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This is in response to the Notice of Non-Compliant Appeal Brief (37 C.F.R. 41.37) mailed on August 24, 2006.

A Supplemental Appellant's Brief is provided in response to the Notice.

Because September 24, 2006, one month after the mailing date of the Notice, falls on a Sunday, the period for response is extended to September 25, 2006, which is the next day that is neither a Saturday, Sunday nor a Federal holiday in the District of Columbia.

If the Examiner has any comments or suggestions that could place this application in even better form, the Examiner is requested to telephone Brian K. Dutton, Reg. No. 47,255, at 202-955-8753.

If any fee is required or any overpayment made, the Commissioner is hereby authorized to charge the fee or credit the overpayment to Deposit Account # 18-0013.

Dated: September 25, 2006

Respectfully submitted,

By________________________

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SUPPLEMENTAL APPELLANT'S BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

INTRODUCTORY COMMENTS

This is an Appeal Brief under 37 C.F.R. §41.37 appealing the final decision of the Examiner dated January 9, 2006. Each of the topics required by 37 C.F.R. §41.37 is presented herewith and is labeled appropriately.

This brief is in furtherance of the Final Office Action on January 9, 2006.

A Notice of Appeal with a *one-month* extension has been filed in this case on May 9, 2006.

A Two-Month Extension of Time has been filed on June 9, 2006.

I. REAL PARTY IN INTEREST

Sony Corporation of Tokyo, Japan ("Sony") is the real party in interest of the present application. An assignment of all rights in the present application to Sony was executed by the inventor and recorded by the U.S. Patent and Trademark Office at **Reel 011452, Frame 0056**.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences that will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

Within the Final Office Action of January 9, 2006:

Paragraph 1 indicates a rejection of claims 19-48 under 35 U.S.C. §102 as allegedly being anticipated by U.S. Patent No. 5,911,619 to Uzoh et al. (Uzoh).

Paragraph 28 makes reference to claims 49-51.

Thus, the status of the claims is as follows:

1-18. (Canceled)

19-51. (Rejected)

No claims are indicated within the Final Office Action to contain allowable subject matter.

Accordingly, Appellant hereby appeals the final rejection of claims 19-51 which are presented in the Claims Appendix.

IV. STATUS OF AMENDMENTS

Subsequent to the final rejection of January 9, 2006, an Amendment After Final Action (37 CFR Section 1.116) has been filed on March 22, 2006. However, the Advisory Action mailed on May 5, 2006 failed to indicate the entry of the Amendment.

No Amendment has been filed after the filing on May 5, 2006 of the Amendment After Final Action (37 CFR Section 1.116).

V. SUMMARY OF CLAIMED SUBJECT MATTER

The following description is provided for illustrative purposes and is not intended to limit the scope of the invention.

The present invention relates to a polishing apparatus and a polishing method for flattening an uneven surface accompanying for example a multilayer interconnection structure of a semiconductor device and a method for producing a semiconductor device having a multilayer interconnection structure.

Claims 19-24, 26-28, 49 - The specification as originally filed teaches the presence of a polishing tool holder 11 for holding and rotating the polishing tool 3 and holding the polishing tool 3, and a Z-axis positioning mechanism 31 for positioning the polishing tool holder 11 to the target position in the Z-axial direction (Specification at page 17, lines 11-14). The Z-axis positioning

mechanism 31 corresponds to a concrete example of the movement and positioning means of the present invention (Specification at page 17, lines 22-25).

The specification as originally filed teaches that the X-axis movement mechanism 41 corresponds to a concrete example of the rotating and holding means and the relative moving means of the present invention (Specification at page 17, lines 19-22). The X-axis movement mechanism 41 has a wafer table 42 for chucking the wafer W, a holder 45 for rotatably holding the wafer table 42, a drive motor 44 for supplying a drive force for rotating the wafer table 42, a belt 46 for connecting the drive motor 44 and the rotation shaft of the holder 45, a polishing pan 47 provided in the holder 45, an X-axis slider 48 at which the drive motor 44 and the holder 45 are disposed, an X-axis servo motor 49 mounted on a not illustrated base, a ball screw shaft 49a connected to the X-axis servo motor 49, and a moveable member 49b connected to the X-axis slider 48 and with a screw portion screwed into the ball screw shaft 49a formed therein (Specification at page 18, line 23 to page 19, line 10). The X-axis servo motor 49 is driven to rotate by the drive current supplied from an X-axis driver 54 connected to the X-axis servo motor 49 (Specification at page 19, lines 19-21). The X-axis slider 48 moves in the X-axial direction via the ball screw shaft 49a and the moveable member 49b (Specification at page 19, lines 21-23). At this time, by controlling the drive current supplied to the X-axis servo motor 49, the control of the speed of the wafer table 42 in the X-axial direction becomes possible (Specification at page 19, line 23 to page 20, line 1).

Claim 19 is drawn to a polishing apparatus comprising:

a polishing tool (3) having a polishing surface and having conductivity;

a polishing tool rotating and holding means (11) for rotating said polishing tool (3) about a predetermined axis of rotation (Z) and holding the same;

a rotating and holding means (41) for holding a polishing object (W) and rotating the same about a predetermined axis of rotation;

a movement and positioning means (31) for moving and positioning said polishing tool (3) to a target position in a direction facing said polishing object (W);

a relative moving means (41, 49, 49a, 49b, 54) for making the polished surface of said polishing object (W) and the polishing surface of said polishing tool (3) relatively move along a predetermined plane (x-axis);

an electrolyte feeding means (81) for feeding an electrolyte (ES) onto the polished surface of said polishing object (W); and

an electrolytic current supplying means (61) for supplying an electrolytic current flowing through said polishing tool (3) through said electrolyte (ES) from said polished surface by using the polished surface of said polishing object (W) as an anode and said polishing tool (3) as a cathode.

Claim 25 - Within claim 25, said scrub member (24) is formed from a material which absorbs the electrolyte (ES) and the chemical polishing agent including the polishing abrasive and able to supply a current and supplies the electrolyte and/or chemical polishing agent supplied from said electrode plate side to the polished surface of said polished object (W) (Specification page 24, line 18 through page 25, line 12).

Claim 29 - Claim 29 further comprises a resistance value detecting means (63) for detecting an electrical resistance between said electrode plate (23) and said polishing tool (3) through the polished surface of said polished object (W) (Specification page 30, lines 12-20).

Claim 30 - Claim 30 further comprises a control means for controlling a position of a facing direction of said polishing tool (3) and said polished object (W) so that the value of the electrolytic current becomes constant based on a detection signal of said current detecting means (62) (Specification page 32, lines 6-20).

Claims 31-32, 50 - The specification as originally filed teaches the presence of a polishing tool holder 11 for holding and rotating the polishing tool 3 and holding the polishing tool

3, and a Z-axis positioning mechanism 31 for positioning the polishing tool holder 11 to the target position in the Z-axial direction (Specification at page 17, lines 11-14). The Z-axis positioning mechanism 31 corresponds to a concrete example of the movement and positioning means of the present invention (Specification at page 17, lines 22-25).

The specification as originally filed teaches that the X-axis movement mechanism 41 corresponds to a concrete example of the rotating and holding means and the relative moving means of the present invention (Specification at page 17, lines 19-22). The X-axis movement mechanism 41 has a wafer table 42 for chucking the wafer W, a holder 45 for rotatably holding the wafer table 42, a drive motor 44 for supplying a drive force for rotating the wafer table 42, a belt 46 for connecting the drive motor 44 and the rotation shaft of the holder 45, a polishing pan 47 provided in the holder 45, an X-axis slider 48 at which the drive motor 44 and the holder 45 are disposed, an X-axis servo motor 49 mounted on a not illustrated base, a ball screw shaft 49a connected to the X-axis servo motor 49, and a moveable member 49b connected to the X-axis slider 48 and with a screw portion screwed into the ball screw shaft 49a formed therein (Specification at page 18, line 23 to page 19, line 10). The X-axis servo motor 49 is driven to rotate by the drive current supplied from an X-axis driver 54 connected to the X-axis servo motor 49 (Specification at page 19, lines 19-21). The X-axis slider 48 moves in the X-axial direction via the ball screw shaft 49a and the moveable member 49b (Specification at page 19, lines 21-23). At this time, by controlling the drive current supplied to the X-axis servo motor 49, the control of the speed of the wafer table 42 in the X-axial direction becomes possible (Specification at page 19, line 23 to page 20, line 1).

Claim 31 is drawn to a polishing apparatus which comprises a polishing tool (3) having a polishing surface which contacts the entire surface of the polished surface of the polishing object (W) while rotating and which brings said polishing object (W) into contact with said polished surface while rotating it so as to flatten and polish the same, said polishing apparatus comprising:

an electrolyte feeding means (81) for feeding an electrolyte onto said polishing surface,

an anode electrode and a cathode electrode capable of supplying electric power to the polished surface of said polishing object in said polishing surface (Specification page 35, lines 3-13), and

relative moving means (41) for enabling the polished surface of said polishing object (W) and the polishing surface of said polishing tool (3) to move along a predetermined plane relative to each other,

said polishing apparatus flattening and polishing flattens and polishes the polished surface of said polishing object (W) by electrolytic composite polishing which combines electrolytic polishing by said electrolyte and mechanical polishing by said polishing surface (Specification page 37, line 23 to page 38, line 6).

Claims 33-34, 36-40, 51 - The specification as originally filed teaches the presence of a polishing tool holder 11 for holding and rotating the polishing tool 3 and holding the polishing tool 3, and a Z-axis positioning mechanism 31 for positioning the polishing tool holder 11 to the target position in the Z-axial direction (Specification at page 17, lines 11-14). The Z-axis positioning mechanism 31 corresponds to a concrete example of the movement and positioning means of the present invention (Specification at page 17, lines 22-25).

The specification as originally filed teaches that the X-axis movement mechanism 41 corresponds to a concrete example of the rotating and holding means and the relative moving means of the present invention (Specification at page 17, lines 19-22). The X-axis movement mechanism 41 has a wafer table 42 for chucking the wafer W, a holder 45 for rotatably holding the wafer table 42, a drive motor 44 for supplying a drive force for rotating the wafer table 42, a belt 46 for connecting the drive motor 44 and the rotation shaft of the holder 45, a polishing pan 47 provided in the holder 45, an X-axis slider 48 at which the drive motor 44 and the holder 45 are disposed, an X-axis servo motor 49 mounted on a not illustrated base, a ball screw shaft 49a connected to the X-axis servo motor 49, and a moveable member 49b connected to the X-axis slider 48 and with a screw portion screwed into the ball screw shaft 49a formed therein (Specification at page 18, line 23

to page 19, line 10). The X-axis servo motor 49 is driven to rotate by the drive current supplied from an X-axis driver 54 connected to the X-axis servo motor 49 (Specification at page 19, lines 19-21). The X-axis slider 48 moves in the X-axial direction via the ball screw shaft 49a and the moveable member 49b (Specification at page 19, lines 21-23). At this time, by controlling the drive current supplied to the X-axis servo motor 49, the control of the speed of the wafer table 42 in the X-axial direction becomes possible (Specification at page 19, line 23 to page 20, line 1).

Claim 33 is drawn to a polishing method including the steps of:

pushing the polishing surface of a conductive polishing tool (3) and the surface of the polishing object (W) with a metal film (107) formed on at least the surface or an inner layer against each other while interposing the electrolyte (EL) therebetween (Specification at page 43, line 20 to page 44, line 3);

supplying the electrolytic current flowing from the surface of said polishing object to said polishing tool through said electrolyte by using said polishing tool as a cathode and the surface of said polishing object as an anode (Specification at page 44, lines 16-21);

making said polishing tool (3) and said polishing object (W) move relatively along a predetermined plane while rotating the two (Specification at page 44, line 16 to page 45, line 15); and

flattening the metal film formed on said polishing object (W) by electrolytic composite polishing combining electrolytic polishing by the electrolyte and mechanical polishing by the polishing surface (Specification at page 45, line 12 to page 49, line 18).

Claim 35 - Within claim 35, said polished object (W) comprises a stack of a plurality of films (105, 107) comprised of different materials (Specification page 41, lines 8-17), and

the current flowing from the surface of the polished object (W) to the polishing tool (3) through the electrolyte, changing in response to differences in the electrical characteristics of the

materials of the films (105, 107), is monitored and the progress in the polishing is managed based on the magnitude of the electrolytic current (Specification page 30, lines 6-11).

Claim 39 - Claim 39 further includes the step of managing the progress of the polishing of the polished object (W) based on the magnitude of the electrical resistance between said electrode member (23) and said polishing tool through the surface of the polished object (Specification at page 44, line 3 to page 47, line 14).

Claims 41-42, 44, 46, 48 - The specification as originally filed teaches the presence of a polishing tool holder 11 for holding and rotating the polishing tool 3 and holding the polishing tool 3, and a Z-axis positioning mechanism 31 for positioning the polishing tool holder 11 to the target position in the Z-axial direction (Specification at page 17, lines 11-14). The Z-axis positioning mechanism 31 corresponds to a concrete example of the movement and positioning means of the present invention (Specification at page 17, lines 22-25).

The specification as originally filed teaches that the X-axis movement mechanism 41 corresponds to a concrete example of the rotating and holding means and the relative moving means of the present invention (Specification at page 17, lines 19-22). The X-axis movement mechanism 41 has a wafer table 42 for chucking the wafer W, a holder 45 for rotatably holding the wafer table 42, a drive motor 44 for supplying a drive force for rotating the wafer table 42, a belt 46 for connecting the drive motor 44 and the rotation shaft of the holder 45, a polishing pan 47 provided in the holder 45, an X-axis slider 48 at which the drive motor 44 and the holder 45 are disposed, an X-axis servo motor 49 mounted on a not illustrated base, a ball screw shaft 49a connected to the X-axis servo motor 49, and a moveable member 49b connected to the X-axis slider 48 and with a screw portion screwed into the ball screw shaft 49a formed therein (Specification at page 18, line 23 to page 19, line 10). The X-axis servo motor 49 is driven to rotate by the drive current supplied from an X-axis driver 54 connected to the X-axis servo motor 49 (Specification at page 19, lines 19-21). The X-axis slider 48 moves in the X-axial direction via the ball screw shaft 49a and the moveable member 49b (Specification at page 19, lines 21-23). At this time, by controlling the drive

current supplied to the X-axis servo motor 49, the control of the speed of the wafer table 42 in the X-axial direction becomes possible (Specification at page 19, line 23 to page 20, line 1).

Claim 41 is drawn to a polishing method including the steps of:

forming a passivation film (108) exhibiting a function of preventing an electrolytic reaction of the metal film at the surface of the metal film (107) formed on the polishing object (W) (Specification page 42, lines 13-16);

pushing the polishing surface of a conductive polishing tool (3) and a metal film (107) against each together while interposing an electrolyte (EL) between the polishing surface and the metal film (107), and then applying a predetermined voltage between said polishing tool (3) and said metal film (107) (Specification page 46, line 23 to page 47, line 16);

making the polishing surface of said polishing tool (3) and the metal film (107) of said polishing object (W) move relatively along a predetermined plane and selectively removing a passivation film (108) on a projecting portion projected from the polishing surface of said polishing tool (3) in said metal film (107) by mechanical polishing by said polishing tool (3) (Specification page 43, line 20 to page 44, line 3); and

removing a projecting portion of the metal film (107) exposed at the surface due to the removal of said passivation film (108) by the electrolytic polishing function by said electrolyte and flattening said metal film (Specification page 47, line 18 to page 48, line 1).

Claim 43 - Within claim 43, said passivation film (108) comprises of an oxide film formed by oxidizing the surface of said metal film (107) (Specification page 42, lines 17-21).

Claim 45 - Within claim 45, said passivation film (108) is higher in electrical resistance and lower in mechanical strength compared with the metal film (Specification page 43, lines 3-7).

Claim 47 - Claim 47 further includes the step of managing the progress of the polishing based on the magnitude of the electrical resistance between said electrode member (23) and said polishing tool (3) (Specification page 30, lines 12-20).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The issues presented for consideration in this appeal are as follows:

Whether the Examiner erred in rejecting claims 19-51 under 35 U.S.C. §102 as allegedly being anticipated by U.S. Patent No. 5,911,619 to Uzoh et al. (Uzoh).

This issue will be discussed hereinbelow.

VII. ARGUMENT

In the Final Office Action of January 9, 2006:

The Examiner erred in rejecting claims 19-51 under 35 U.S.C. §102 as allegedly being anticipated by U.S. Patent No. 5,911,619 to Uzoh et al. (Uzoh).

For at least the following reasons, Appellant submits that this rejection is both technically and legally unsound and should therefore be reversed.

Grouping of claims

Claims 19-51 are currently pending in this application, with claims 19, 31, 33, and 41 being independent. For purposes of the issues presented by this appeal:

Claims 19-24, 26-28, 49 stand or fall together.

Claim 25 stands or falls alone.

Claim 29 stands or falls alone.

Claim 30 stands or falls alone.

Claims 31-32, 50 stand or fall together.

Claims 33-34, 36-40, 51 stand or fall together.

Claim 35 stands or falls alone.

Claim 39 stands or falls alone.

Claims 41-42, 44, 46, 48 stand or fall together.

Claim 43 stands or falls alone.

Claim 45 stands or falls alone.

Claim 47 stands or falls alone.

The arguments set forth in the following section provide reasons why these claims are considered patentable, 37 C.F.R. §41.37(c)(1)(vii).

The Examiner erred in rejecting claims 19-51 under 35 U.S.C. §102 as allegedly being anticipated by U.S. Patent No. 5,911,619 to Uzoh et al. (Uzoh).

Claims 19-24, 26-28, 49- Claims 20-30 are dependent upon claim 19. The rejection of claim 19 is traversed at least for the following reasons.

Claim 19 is drawn to a polishing apparatus comprising:

a polishing tool having a polishing surface and having conductivity;

a polishing tool rotating and holding means for rotating said polishing tool about a predetermined axis of rotation and holding the same;

a rotating and holding means for holding a polishing object and rotating the same about a predetermined axis of rotation;

a movement and positioning means for moving and positioning said polishing tool to a target position in a direction facing said polishing object;

a relative moving means for making the polished surface of said polishing object and the polishing surface of said polishing tool relatively move along a predetermined plane;

an electrolyte feeding means for feeding an electrolyte onto the polished surface of said polishing object; and

an electrolytic current supplying means for supplying an electrolytic current flowing through said polishing tool through said electrolyte from said polished surface by using the polished surface of said polishing object as an anode and said polishing tool as a cathode.

Uzoh arguably teaches a polishing pad 64, and a platen 62 and a rotatable shaft 68 (Uzoh at Figure 7).

Uzoh arguably teaches a rotatable workpiece carrier 66 for holding a wafer W (Uzoh at Figure 7).

Uzoh arguably teaches a container 70 coupled to a conduit 72 arranged and dimensioned for dispensing an electrolytic polishing slurry 74 onto the pad 64 during a normal operation of the apparatus 60 (Uzoh at Figure 7).

Uzoh arguably teaches a source 80 to vary the electrochemical current i (Uzoh at Figure 11a).

The claims include a movement and positioning means for moving and positioning said polishing tool to a target position in a direction facing said polishing object. The specification as originally filed teaches the presence of a Z-axis positioning mechanism 31 for positioning the polishing tool holder 11 to the target position in the Z-axial direction (Specification at page 17, lines 11-14). The Z-axis positioning mechanism 31 corresponds to a concrete example of the movement and positioning means of the present invention (Specification at page 17, lines 22-25).

However, Uzoh *fails* to disclose, teach or suggest a movement and positioning means for moving and positioning the polishing pad 64 to a target position in a direction facing the wafer W.

The claims include a relative moving means for making the polished surface of said polishing object and the polishing surface of said polishing tool relatively move along a predetermined plane.

The specification as originally filed teaches that the X-axis movement mechanism 41 corresponds to a concrete example of the rotating and holding means and the relative moving means of the present invention (Specification at page 17, lines 19-22). The X-axis movement mechanism 41 has a wafer table 42 for chucking the wafer W, a holder 45 for rotatably holding the wafer table 42, a drive motor 44 for supplying a drive force for rotating the wafer table 42, a belt 46 for connecting the drive motor 44 and the rotation shaft of the holder 45, a polishing pan 47 provided in the holder 45, an X-axis slider 48 at which the drive motor 44 and the holder 45 are disposed, an X-axis servo motor 49 mounted on a not illustrated base, a ball screw shaft 49a connected to the X-axis servo motor 49, and a moveable member 49b connected to the X-axis slider 48 and with a screw portion screwed into the ball screw shaft 49a formed therein (Specification at page 18, line 23 to page 19, line 10). The X-axis servo motor 49 is driven to rotate by the drive current supplied from an X-axis driver 54 connected to the X-axis servo motor 49 (Specification at page 19, lines 19-21). The X-axis slider 48 moves in the X-axial direction via the ball screw shaft 49a and the

moveable member 49b (Specification at page 19, lines 21-23). At this time, by controlling the drive current supplied to the X-axis servo motor 49, the control of the speed of the wafer table 42 in the X-axial direction becomes possible (Specification at page 19, line 23 to page 20, line 1).

However, Uzoh also *fails* to disclose, teach, or suggest a relative moving means for making the polished surface of the wafer W and the polishing surface of the polishing pad 64 relatively move along a predetermined plane.

Advisory Action - Page 2 of the Advisory Action includes a reference to Figures 13 and 15 Uzoh in its reasoning for the continued rejection of the claims. In this regard, the position of the Examiner has shifted since no specific reference to Figure 15 is found within the Final Office Action. Nevertheless, page 2 of the Advisory Action contends that Figure 15 of Uzoh teaches a movement and positioning means for moving and positioning the polishing pad 64 to a target position in a direction facing the wafer W.

In response to this contention, Figure 11 arguably teaches a presence of a polishing pad 64 on a rotatable platen 62. However, Figure 11 of Uzoh fails to disclose, teach, or suggest a polished surface of the polishing object being an ***anode*** and the polishing tool as a ***cathode***.

Moreover, Figure 13 of Uzoh also teaches the presence of a polishing pad 64. However, Figure 13 of Uzoh fails to disclose, teach, or suggest a polished surface of the polishing object being an ***anode*** and the polishing tool as a ***cathode***.

Regarding Figure 15 of Uzoh, column 3, line 65 to column 4, line 10, of Uzoh arguably teaches that:

> FIG. 15 is a schematic view of a further alternative embodiment of the invention, showing a wafer W held on a carrier table CT such that the layer 18 faces a movable polishing head MPH, and showing an endpoint detector such as an optical reflectivity monitor including a light source LS (e.g., laser), a movable mirror MM and a position sensitive detector PSD which measures light intensity as a function of a position on the

wafer. When the detector receives a detector signal indicating that the thickness of the layer 18 is very thin, or has been removed, the detector signal is interpreted by the controller to command the supply 80 to decrease the magnitude of the electrical potential provided by the supply 80.

Uzoh arguably teaches that FIGS. 15 and 16 show further alternative embodiments having a layer 18 facing a moveable polishing head mpH (Uzoh at column 6, lines 28-31).

However, the Office Action *fails* to identify any teaching within Figure 15 of Uzoh to show that the claimed *movement and positioning means for moving and positioning said polishing tool to a target position in a direction facing said polishing object* is to be found within Figure 15 of Uzoh.

Additionally, the Office Action *fails* to identify any teaching within Figure 15 of Uzoh to show that the claimed *relative moving means for making the polished surface of said polishing object and the polishing surface of said polishing tool relatively move along a predetermined plane* is to be found within Figure 15 of Uzoh.

Claim 25- The rejection of claim 25 is traversed at least for the reasons provided hereinabove with respect to claim 19, and for the following reasons.

Within claim 25, said scrub member is formed from a material which absorbs the electrolyte and the chemical polishing agent including the polishing abrasive and able to supply a current and supplies the electrolyte and/or chemical polishing agent supplied from said electrode plate side to the polished surface of said polished object.

The specification as originally filed provides that the scrub member 24 adhered to the bottom surface of the electrode plate 23 is formed by a material capable of absorbing the electrolyte and the slurry and passing them from the upper surface to the lower surface (Specification at page 24, line 25 to page 25, line 3).

The Final Office Action contends that Uzoh teaches element 66 as being a scrub member (Final Office Action at page 3).

While Uzoh arguably teaches the presence of a workpiece carrier 66, Uzoh fails to disclose, teach or suggest workpiece carrier 66 as being formed from a material which absorbs the electrolyte and the chemical polishing agent including the polishing abrasive and able to supply a current and supplies the electrolyte and/or chemical polishing agent supplied from the electrode plate side to the polished surface of the polished object.

Claim 29- The rejection of claim 29 is traversed at least for the reasons provided hereinabove with respect to claim 19, and for the following reasons.

Claim 29 includes a resistance value detecting means for detecting an electrical resistance between said electrode plate and said polishing tool through the polished surface of said polished object.

The specification as originally filed teaches that the electrolytic power supply 61 is provided with a resistance meter 63 as a resistance value detecting means of the present invention (Specification at page 30, lines 12-14).

However, a resistance meter is absent from within Uzoh.

Claim 30- The rejection of claim 30 is traversed at least for the reasons provided hereinabove with respect to claim 29, and for the following reasons.

Claim 30 includes a control means for controlling a position of a facing direction of said polishing tool and said polished object so that the value of the electrolytic current becomes constant based on a detection signal of said current detecting means.

The specification as originally filed teaches that the controller 55 is able to control the operation of the polishing apparatus 1 based on these current value signal 62s and electric resistance

value signal 63s (Specification at page 32, lines 9-12). Specifically, it controls the Z-axis servo motor 18 by using the current value signal 62s as a feedback signal so that the electrolytic current obtained from the current value signal 62s becomes constant or controls the operation of the polishing apparatus 1 so as to stop the polishing based on the current value or the electric resistance value specified by the current value signal 62s or the electric resistance value signal 63s (Specification at page 32, lines 12-20).

However, a control means is absent from within Uzoh.

Claims 31-32, 50- The rejection of claim 31 is traversed at least for the following reasons.

Claim 31 is drawn to a polishing apparatus which comprises a polishing tool having a polishing surface which contacts the entire surface of the polished surface of the polishing object while rotating and which brings said polishing object into contact with said polished surface while rotating it so as to flatten and polish the same, said polishing apparatus comprising:

an electrolyte feeding means for feeding an electrolyte onto said polishing surface,

an anode electrode and a cathode electrode capable of supplying electric power to the polished surface of said polishing object in said polishing surface, and

relative moving means for enabling the polished surface of said polishing object and the polishing surface of said polishing tool to move along a predetermined plane relative to each other,

said polishing apparatus flattening and polishing flattens and polishes the polished surface of said polishing object by electrolytic composite polishing which combines electrolytic polishing by said electrolyte and mechanical polishing by said polishing surface.

As noted hereinabove, Uzoh *fails* to disclose, teach, or suggest a relative moving means for enabling the polished surface of said polishing object and the polishing surface of said polishing tool to move along a predetermined plane relative to each other.

Claims 33-34, 36-40, 51- Claims 34-40 are dependent upon claim 33. The rejection of claim 33 is traversed at least for the following reasons.

Claim 33 is drawn to a polishing method including the steps of:

pushing the polishing surface of a conductive polishing tool and the surface of the polishing object with a metal film formed on at least the surface or an inner layer against each other while interposing the electrolyte therebetween;

supplying the electrolytic current flowing from the surface of said polishing object to said polishing tool through said electrolyte by using said polishing tool as a cathode and the surface of said polishing object as an anode,

making said polishing tool and said polishing object move relatively along a predetermined plane while rotating the two; and

flattening the metal film formed on said polishing object by electrolytic composite polishing combining electrolytic polishing by the electrolyte and mechanical polishing by the polishing surface.

Claim 33 includes a step of making said polishing tool and said polishing object move relatively along a predetermined plane while rotating the two.

The specification as originally filed teaches that the X-axis movement mechanism 41 corresponds to a concrete example of the rotating and holding means and the relative moving means of the present invention (Specification at page 17, lines 19-22). The X-axis movement mechanism 41 has a wafer table 42 for chucking the wafer W, a holder 45 for rotatably holding the wafer table

42, a drive motor 44 for supplying a drive force for rotating the wafer table 42, a belt 46 for connecting the drive motor 44 and the rotation shaft of the holder 45, a polishing pan 47 provided in the holder 45, an X-axis slider 48 at which the drive motor 44 and the holder 45 are disposed, an X-axis servo motor 49 mounted on a not illustrated base, a ball screw shaft 49a connected to the X-axis servo motor 49, and a moveable member 49b connected to the X-axis slider 48 and with a screw portion screwed into the ball screw shaft 49a formed therein (Specification at page 18, line 23 to page 19, line 10). The X-axis servo motor 49 is driven to rotate by the drive current supplied from an X-axis driver 54 connected to the X-axis servo motor 49 (Specification at page 19, lines 19-21). The X-axis slider 48 moves in the X-axial direction via the ball screw shaft 49a and the moveable member 49b (Specification at page 19, lines 21-23). At this time, by controlling the drive current supplied to the X-axis servo motor 49, the control of the speed of the wafer table 42 in the X-axial direction becomes possible (Specification at page 19, line 23 to page 20, line 1).

Uzoh *fails* to disclose, teach, or suggest a step of making said polishing tool and said polishing object move relatively along a predetermined plane while rotating the two.

Claim 35- The rejection of claim 35 is traversed at least for the reasons provided hereinabove with respect to claim 33, and for the following reasons.

Within claim 35, said polished object comprises a stack of a plurality of films comprised of different materials, and the current flowing from the surface of the polished object to the polishing tool through the electrolyte, changing in response to differences in the electrical characteristics of the materials of the films, is monitored and the progress in the polishing is managed based on the magnitude of the electrolytic current.

The specification as originally filed teaches that the controller 55 is able to control the operation of the polishing apparatus 1 based on these current value signal 62s and electric resistance value signal 63s (Specification at page 32, lines 9-12). Specifically, it controls the Z-axis servo motor 18 by using the current value signal 62s as a feedback signal so that the electrolytic current obtained from the current value signal 62s becomes constant or controls the operation of the

polishing apparatus 1 so as to stop the polishing based on the current value or the electric resistance value specified by the current value signal 62s or the electric resistance value signal 63s (Specification at page 32, lines 12-20).

Uzoh arguably teaches that preferably, the source of potential 80 is electronic computer controlled--FIG. 13. FIG. 13, the source 80 includes or is connected to a controller having a CPU (e.g., microprocessor), Memory, Buses, I/O ports, all suitably interconnected to signal receiver circuits 81 and to an endpoint detector arrangement, to control the current i according, e.g., to the waveforms of FIG. 14 (Uzoh at column 5, lines 22-28). Software instructions and data can be coded and stored within the Memory, for causing the controller to generate suitable signals to the source 80 to control the current i. (Uzoh at column 5, lines 28-32).

Yet, Uzoh fails to disclose, teach or suggest that the current flowing from the surface of the wafer W to the pad 64 through the electrolyte, changing in response to differences in the electrical characteristics of the materials of the films, is monitored and the progress in the polishing is managed based on the magnitude of the electrolytic current.

Claim 39- The rejection of claim 35 is traversed at least for the reasons provided hereinabove with respect to claim 33, and for the following reasons.

Claim 39 includes the step of managing the progress of the polishing of the polished object based on the magnitude of the electrical resistance between said electrode member and said polishing tool through the surface of the polished object.

The specification as originally filed teaches that the electrolytic power supply 61 is provided with a resistance meter 63 as a resistance value detecting means of the present invention (Specification at page 30, lines 12-14).

However, a step of managing the progress of the polishing of the polished object based on the magnitude of the electrical resistance between said electrode member and said polishing tool through the surface of the polished object is absent from within Uzoh.

<u>Claims 41-42, 44, 46, 48</u>- Claims 42-48 are dependent upon claim 41. The rejection of claim 41 is traversed at least for the following reasons.

Claim 41 is drawn to a polishing method including the steps of:

forming a passivation film exhibiting a function of preventing an electrolytic reaction of the metal film at the surface of the metal film formed on the polishing object;

pushing the polishing surface of a conductive polishing tool and a metal film against each together while interposing an electrolyte between the polishing surface and the metal film, and then applying a predetermined voltage between said polishing tool and said metal film;

making the polishing surface of said polishing tool and the metal film of said polishing object move relatively along a predetermined plane and selectively removing a passivation film on a projecting portion projected from the polishing surface of said polishing tool in said metal film by mechanical polishing by said polishing tool; and

removing a projecting portion of the metal film exposed at the surface due to the removal of said passivation film by the electrolytic polishing function by said electrolyte and flattening said metal film.

As noted hereinabove, Uzoh also *<u>fails</u>* to disclose, teach or suggest a step of making the polishing surface of said polishing tool and the metal film of said polishing object move relatively along a predetermined plane and selectively removing a passivation film on a projecting portion projected from the polishing surface of said polishing tool in said metal film by mechanical polishing by said polishing tool.

<u>Claim 43</u>- The rejection of claim 43 is traversed at least for the reasons provided hereinabove with respect to claim 41, and for the following reasons.

Within claim 43, said passivation film comprises of an oxide film formed by oxidizing the surface of said metal film.

Uzoh arguably teaches that the wafer includes, for example, a Si substrate 14 having an insulator 16 (e.g., a SiO_2 layer), a conductor 18 (e.g., a Cu layer) and a microelectronic component 20 (e.g., a CMOS device) disposed thereon (Uzoh at column 1, lines 34-38).

However, Uzoh fails to disclose, teach, or suggest insulator 16 as being a passivation layer.

Claim 45- The rejection of claim 45 is traversed at least for the reasons provided hereinabove with respect to claim 41, and for the following reasons.

Within claim 45, said passivation film is higher in electrical resistance and lower in mechanical strength compared with the metal film.

However, Uzoh fails to disclose, teach or suggest a passivation film that is higher in electrical resistance and lower in mechanical strength compared with the metal film.

Claim 47- The rejection of claim 47 is traversed at least for the reasons provided hereinabove with respect to claim 41, and for the following reasons.

Claim 47 includes the step of managing the progress of the polishing based on the magnitude of the electrical resistance between said electrode member and said polishing tool.

The specification as originally filed teaches that the electrolytic power supply 61 is provided with a resistance meter 63 as a resistance value detecting means of the present invention (Specification at page 30, lines 12-14).

However, a step of managing the progress of the polishing based on the magnitude of the electrical resistance between said electrode member and said polishing tool is absent from within Uzoh.

Conclusion

The claims are considered allowable for the same reasons discussed above, as well as for the additional features they recite.

Reversal of the Examiner's decision is respectfully requested.

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Respectfully submitted,

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CLAIMS APPENDIX

1-18. (Canceled)

19. (Original) A polishing apparatus comprising:

a polishing tool having a polishing surface and having conductivity;

a polishing tool rotating and holding means for rotating said polishing tool about a predetermined axis of rotation and holding the same;

a rotating and holding means for holding a polishing object and rotating the same about a predetermined axis of rotation;

a movement and positioning means for moving and positioning said polishing tool to a target position in a direction facing said polishing object;

a relative moving means for making the polished surface of said polishing object and the polishing surface of said polishing tool relatively move along a predetermined plane;

an electrolyte feeding means for feeding an electrolyte onto the polished surface of said polishing object; and

an electrolytic current supplying means for supplying an electrolytic current flowing through said polishing tool through said electrolyte from said polished surface by using the polished surface of said polishing object as an anode and said polishing tool as a cathode.

20. (Previously presented) The polishing apparatus as set forth in claim 19, further comprising a polishing agent feeding means for feeding a chemical polishing agent including a polishing abrasive on to the polished surface of the polished object.

21. (Previously presented) The polishing apparatus as set forth in claim 19, wherein said electrolytic current supplying means comprises:

a current supplying means arranged to be able to be brought into contact or proximity with the polished surface of said polished object and supply current to the polished surface using the polished surface of the polished object as an anode, and

a DC power supply supplying a predetermined DC power between said current supplying means and said polishing tool.

22. (Previously presented) The polishing apparatus as set forth in claim 21, wherein said DC power supply outputs a pulse-like voltage of a predetermined period.

23. (Previously presented) The polishing apparatus as set forth in claim 21, wherein

said polishing tool comprises a wheel-shaped conductive member and one annular end face of said member comprises a polishing surface, and

said current supplying means comprises a conductive electrode plate provided at the inside of the polishing tool away from the polishing tool, held by said rotation and holding means, and rotated along with said polishing tool.

24. (Previously presented) The polishing apparatus as set forth in claim 23, wherein said electrode plate comprises a scrub member having a surface for scrubbing the polished surface at the side facing the polished surface of the polished object.

25. (Previously presented) The polishing apparatus as set forth in claim 24, wherein said scrub member is formed from a material which absorbs the electrolyte and the chemical polishing agent including the polishing abrasive and able to supply a current and supplies the electrolyte and/or chemical polishing agent supplied from said electrode plate side to the polished surface of said polished object.

26. (Previously presented) The polishing apparatus as set forth in claim 21, wherein said polishing tool is held by a conductive member connected with said rotation and holding means and is supplied with current through a conductive brush contacting said rotating conductive member.

27. (Previously presented) The polishing apparatus as set forth in claim 23, wherein said electrode plate comprises a metal more precious than the electrolyzed metal formed on the polished surface of the polished object.

28. (Previously presented) The polishing apparatus as set forth in claim 19, further comprising a current detecting means for detecting a value of an electrolytic current flowing from the polished surface of said polished object to said polishing tool.

29. (Previously presented) The polishing apparatus as set forth in claim 23, further comprising a resistance value detecting means for detecting an electrical resistance between said electrode plate and said polishing tool through the polished surface of said polished object.

30. (Previously presented) The polishing apparatus as set forth in claim 29, further comprising a control means for controlling a position of a facing direction of said polishing tool and said polished object so that the value of the electrolytic current becomes constant based on a detection signal of said current detecting means.

31. (Previously presented) A polishing apparatus which comprises a polishing tool having a polishing surface which contacts the entire surface of the polished surface of the polishing object while rotating and which brings said polishing object into contact with said polished surface while rotating it so as to flatten and polish the same, said polishing apparatus comprising:

an electrolyte feeding means for feeding an electrolyte onto said polishing surface,

an anode electrode and a cathode electrode capable of supplying electric power to the polished surface of said polishing object in said polishing surface, and

relative moving means for enabling the polished surface of said polishing object and the polishing surface of said polishing tool to move along a predetermined plane relative to each other,

said polishing apparatus flattening and polishing flattens and polishes the polished surface of said polishing object by electrolytic composite polishing which combines electrolytic polishing by said electrolyte and mechanical polishing by said polishing surface.

32. (Previously presented) The polishing apparatus as set forth in claim 31,

further comprising a polishing agent feeding means for feeding a chemical polishing agent including a polishing abrasive to the polishing surface, and

said polishing apparatus flattening and polishing the polished surface of the polished object by electrolytic composite polishing combining electrolytic polishing by said electrolyte and chemical mechanical polishing by said polishing surface and said polishing agent.

33. (Original) A polishing method including the steps of:

pushing the polishing surface of a conductive polishing tool and the surface of the polishing object with a metal film formed on at least the surface or an inner layer against each other while interposing the electrolyte therebetween;

supplying the electrolytic current flowing from the surface of said polishing object to said polishing tool through said electrolyte by using said polishing tool as a cathode and the surface of said polishing object as an anode,

making said polishing tool and said polishing object move relatively along a predetermined plane while rotating the two; and

flattening the metal film formed on said polishing object by electrolytic composite polishing combining electrolytic polishing by the electrolyte and mechanical polishing by the polishing surface.

34. (Previously presented) The polishing method as set forth in claim 33, further including the step of interposing a chemical polishing agent containing a polishing abrasive together with said electrolyte between the polishing surface and the surface of the polished object and flattening the metal film formed on the polished object by electrolytic composite polishing combining electrolytic polishing by said electrolyte and chemical mechanical polishing by said polishing surface and said polishing agent.

35. (Previously presented) The polishing method as set forth in claim 33, wherein

said polished object comprises a stack of a plurality of films comprised of different materials, and

the current flowing from the surface of the polished object to the polishing tool through the electrolyte, changing in response to differences in the electrical characteristics of the materials of the films, is monitored and the progress in the polishing is managed based on the magnitude of the electrolytic current.

36. (Previously presented) The polishing method as set forth in claim 33, further including the step of supplying a pulse-like voltage of a predetermined period between the polishing tool and the surface of the polished object to supply said electrolytic current.

37. (Previously presented) The polishing method as set forth in claim 33, further including the step of bringing an electrode member into proximity or contact with the surface of the polished object supplied with the electrolyte to supply current to the surface of the polished object.

38. (Previously presented) The polishing method as set forth in claim 37, further including the step of supplying current to the metal film formed on said polished object while making said electrode member rotate along with said polishing tool and making it move relatively with respect to the polished object.

39. (Previously presented) The polishing method as set forth in claim 37, further including the step of managing the progress of the polishing of the polished object based on the magnitude of the electrical resistance between said electrode member and said polishing tool through the surface of the polished object.

40. (Previously presented) The polishing method as set forth in claim 34, further including the step of positively charging the polishing abrasive contained in the polishing agent.

41. (Original) A polishing method including the steps of:

forming a passivation film exhibiting a function of preventing an electrolytic reaction of the metal film at the surface of the metal film formed on the polishing object;

pushing the polishing surface of a conductive polishing tool and a metal film against each together while interposing an electrolyte between the polishing surface and the metal film, and then applying a predetermined voltage between said polishing tool and said metal film;

making the polishing surface of said polishing tool and the metal film of said polishing object move relatively along a predetermined plane and selectively removing a passivation film on a projecting portion projected from the polishing surface of said polishing tool in said metal film by mechanical polishing by said polishing tool; and

removing a projecting portion of the metal film exposed at the surface due to the removal of said passivation film by the electrolytic polishing function by said electrolyte and flattening said metal film.

42. (Previously presented) The polishing method as set forth in claim 41, further including the step of interposing a chemical polishing agent containing a polishing abrasive together with said electrolyte between the polishing surface and the metal film and selectively removing the passivation film by chemical mechanical polishing by said polishing surface and said polishing agent.

43. (Previously presented) The polishing method as set forth in claim 41, wherein said passivation film comprises of an oxide film formed by oxidizing the surface of said metal film.

44. (Previously presented) The polishing method as set forth in claim 41, wherein said passivation film forms a film comprised of a material exhibiting an action of inhibiting an electrolytic reaction of the metal comprising said metal film on the surface of said metal film.

45. (Previously presented) The polishing method as set forth in claim 41, wherein said passivation film is higher in electrical resistance and lower in mechanical strength compared with the metal film.

46. (Previously presented) The polishing method as set forth in claim 41, further including the step of bringing an electrode member into proximity or contact with the surface of the metal film to supply current to the surface of the metal film.

47. (Previously presented) The polishing method as set forth in claim 46, further including the step of managing the progress of the polishing based on the magnitude of the electrical resistance between said electrode member and said polishing tool.

48. (Previously presented) The polishing method as set forth in claim 42, further including the step of positively charging the polishing abrasive contained in the polishing agent.

49. (Previously presented) The polishing apparatus as set forth in claim 19, wherein said relative moving means further enables selectively removing a passivation film on a projecting portion of the polishing surface of said polishing tool.

50. (Previously presented) The polishing apparatus as set forth in claim 31, wherein said relative moving means further enables selectively removing a passivation film on a projecting portion of the polishing surface of said polishing tool.

51. (Previously presented) The polishing method as set forth in claim 33, further comprising the step of:

selectively removing a passivation film on a projecting portion projected from the polishing surface of said polishing tool in said metal film by mechanical polishing by said polishing tool.

EVIDENCE APPENDIX

There is no other evidence that will directly affect or have a bearing on the Board's decision in this appeal.

RELATED PROCEEDINGS APPENDIX

There are no other appeals or interferences that will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.